but probably is not. The apparent increase in rate is more likely due to aggradation with glacial outwash or to the building of a fan on the delta at the northern end.

Craigton not only began, but probably completed its history as a lake before the tilting occurred; a considerable part of its tilting must have occurred before the Iroquois beaches were tilted and all of it before the Algonquin was tilted, because in the first place its tilting is greater than that of the Iroquois; and in the second, Algonquin tilting did not proceed so far south. Had water remained in Craigton during the tilting, it must have spilled over southward. There can be found no evidence of static water work on the hills above the recorded beach levels at the southern end. If water stood higher here, then many tracts, low between moraine hills but higher than 960 feet, should have been under water and should attest that fact by sorted drift, lake clays, and possibly by black earth deposits of palustrial origin. Nothing of the sort can be found.

Because the outlet was in the middle portion of the lake the southern part would not be drained by the tilting. Drainage possibly fairly well established would be interfered with; swampy conditions would develop and will persist until more perfect drainage is attained. Black, peaty earth, very abundant in the southern part, confirms the belief that this end of the lake was long swampy. In fact artificial ditching has but recently put it into agricultural condition. Hundreds of acres of onions are now grown on the black flats that are sufficiently drained. Water does not stand anywhere on the plain but swampy conditions are not entirely removed.

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II

COMPARATIVE PHYSIOLOGY

The Reactions of Normal and Eyeless Amphibian Larvæ to Light: HENRY LAURENS.

Although the photic reactions of Amphibians have been extensively investigated very little has been done on the larval forms. The purpose of the present investigation was to test the reactions to white light of normal and eyeless frog (*R. pipiens* and *R. sylvatica*) and *Amblystoma* (*A. punctatum*) larvæ. The optic vesicles were removed from the blinded individuals at a stage of development soon after the closure of the neural folds, when the tail bud is just beginning to be perceptible. Frog larvæ, both normal and blinded, show no reaction to the stimulus of light. Both normal and eyeless *Amblystoma* larvæ, however, show a very decided positive phototaxis. The reactions of the blinded individuals are apparently not due to the direct stimulation of the central nervous system by the light as is shown by a series of experiments in which three small areas of the larvæ were illuminated, these areas being roughly the head-region, the ventro-lateral mid-body region, and the tail-region. Positive responses were obtained when each of these regions were illuminated by a narrow beam of light, the percentage of positive responses being practically the same in each case. The skin chromatophores of *Amblystoma* larvæ show different conditions of expansion and contraction of their pigment under different conditions of light and darkness; the conditions in the normal and blinded larvæ being exactly opposite. Normal larvæ placed in diffuse light are pale (light brown), blinded larvæ so placed are very dark. Normal larvæ placed in darkness are darkly pigmented (dark brown), while blinded larvæ so placed are very pale. But normal larvæ placed in diffuse light on a black background are darkly pigmented, thereby showing the effect of the background. These different conditions of the pigment in the skin chromatophores do not affect the sensitiveness of the larvæ to light, but previous exposure to light or adaptation to darkness do, in that dark-adapted larvæ are more sensitive to light than are those which have been kept in the light.

An Analysis of the Egg Extractives of Arbacia and Asterias: OTTO C. GLASER.

Analyses (1) by means of sperm-suspensions; (2) by means of qualitative chemical tests; (3) by means of the rate of development, were made. The results briefly summarized, are:

1. A general corroboration of F. R. Lillie's observations with respect to *Arbacia punctulata;* their extension in certain directions, and their application to *Asterias forbesii.* Hetero-agglutination and hetero-activation between *Asterias* and *Arbacia* were found. Agglutination is very likely the result of a surface effect.

2. Proteins, if present at all, do not necessarily come from the eggs, and are extremely dilute. Reducing substances seem to be absent. The agglutinin is heat-resistant. A purple compound, apparently specific for *Arbacia,* is formed when the sperm, the eggs or the agglutinin itself undergo certain changes. More soluble substances are secreted at the moment of fertilization than before. This, together with the fact that the volume of the eggs is smaller after fertilization, constitutes new and strong evidence in favor of the contention that fertilization involves an increase in permeability. From this it need not follow that fertilized eggs are more permeable than unfertilized. In fact this is not very probable.

3. Egg-secretion as well as egg-extract, in certain concentrations, retards development. NaOH in certain concentrations does not accelerate cleavage, but may even depress it. In the same concentrations, it accelerates the development from the blastula to the pluteus. Egg-secretion + NaOH in the above concentrations retards the cleavages much more than either used separately. One can draw no inference from these experiments as to how the egg-secretion acts in retarding development.

The suggestion that development is initiated as the result of a disturbance in equilibrium in which substances antagonistic to oxidation are eliminated is possible. It is equally possible that the removal of the substances lost allows other equally important processes to be set up. The initiation of development is identical with the initiation of cell division. For this process fertilization, even if it involves all that Lillie's theory includes, can not be considered essential, since somatic cells divide without it. This does not imply that the mechanism of fertilization may not be exactly as F. R. Lillie supposes, but the possibility that the initiation of cell division depends on other processes which also occur at the moment of fertilization remains. Neither these suggestions nor the facts on which they are based appear to the author out of harmony with existing theories. A full discussion will be published in a forthcoming issue of the *Biological Bulletin.*

Feeding Habits of Amœba: ASA A. SCHAEFFER.

The method of investigation is very simple. A very small particle of the substance to be tested was placed in the amœba's path by a very finely drawn out glass needle. Camera lucida drawings were then made at frequent intervals in order to record the behavior accurately. A large number of substances were used: small animals and plants, isolated proteins, carbohydrates, fats, carbon, glass, carmine, etc.; also capillary tubes filled with solutions of various substances.

It was found that the amœba exercises a considerable degree of precision in selection while feeding; objects of food value being eaten while those valueless as food were rejected. However, of the substances eaten, carmine, india ink and uric acid are probably valueless as food; and of the substances refused, casein, gelatin, lecithin and zein are food substances. What the basis is upon which amœba selects its food can not be stated. But amœba eats everything that moves. If a particle of carbon or of glass or other substance is properly agitated by means of a glass needle, such particle will be eaten.

Amœbas react to objects at a distance, whether soluble or insoluble. The maximum distance through which an amœba may sense an insoluble object 20 microns in diameter is from 40 to 60 microns.

Some amœba may be *led* about by "tickling" with an extremely fine glass needle. A typical "food cup" may also be produced in this way.

The behavior of amœba while feeding is subject to very great variation.

Changes in Pattern and Color in Fishes, With Special Reference to Flounders: S. O. MAST.

Abstract in SCIENCE, Vol. XXXVIII., page 699.

The Reactions of the Orb-weaving Spider, Aranea Cavatica; to Rhythmic Vibrations of the Web: W. M. BARROWS. (Illustrated with lantern slides.)

It was found by using vibrating tuning forks and an electric vibrator that when one part of the spider's web is set in rhythmic motion (24–100 vibrations per second amplitude 3–12 mm.) the spider orients, advances rapidly toward the vibrating point, and attacks the vibrating instrument, even biting and throwing web on it. This positive reaction was not obtained when irregular vibrations were used as the stimulus. When a double or Y-shaped vibrator was used the spider oriented and advanced directly between the two vibrating points. The author considers this response a typical tropism and suggests the name "tonotaxis" to designate it.

Secretion in the Protozoan, Folliculina: E. A. ANDREWS.

This specialized *Stentor* secretes a transparent case of green or brown color, resembling a stocking in form. The rounded foot has one flat side

firmly fastened to some solid, the long leg rises up 45 to 90 degrees from the sole and bears on its outside a spiral ridge of six or more turns, while its mouth is completed by a reflexed lip. Three factors enter into the making of this case: the coordinated contractions of the body; the behavior of the cilia; a special secretion. The first factor determines the form of the case, which is then a permanent record of the secretory "instincts" of the animal. The animal first assumes the shape of the future foot of the case and secretes this about itself. Then by a special set of contractions of the anterior part it forms a mould upon which the spiral tube is made, turn by turn, with the measured elongation of the rest of the body. Finally, by an entirely unexpected change in form of the mould the lip of the mouth is added. The only part of the animal in contact with the case is the point of permanent attachment to the bottom of the case, elsewhere the secretion is laid down as a hardening mass separated from the body by the length of the cilia. As the secreting progresses from the foot up the cilia pass through successive states, at first rigid and quiet, then specially active in limiting the inner face of the case wall.

In the posterior end is a special organ, some 10 by 20 microns in diameter, associated with the myonemes.

In response to contact with solids of some kinds the posterior end puts out an adhesive secretion that, apparently mechanically, influences other *Folliculinas,* so that from the free-swimming state they commonly settle down in colonies, each with its separate case, but all fast to a common pellicle spread over the solid object or even over the surface film of quiet water.

The case is secreted when the specialized frontal field and lobes are not yet present.

The Reactions to Light and Darkness of the Melanophores of Frog Tadpoles: DAVENPORT HOOKER.

The tadpoles of *Rana pipiens* were used as subjects for investigation and some seventy-five series of experiments were performed. Each series extended over a number of days and each tadpole was subjected to a variety of conditions. The light used in the experiments was either direct sunlight or the light of a 75-candle-power Welsbach mantle. To obtain total darkness, the tadpoles were placed in blackened light-tight boxes or in an unilluminated dark room.

The following results were obtained:

1. The melanophores in the subepidermal layer of connective tissue of tadpoles respond to light and darkness in the opposite manner from those in the corium of adult frogs, with which they are identical. The former expand in response to light and contract in response to dark.
2. The epidermal melanophores do not respond.
3. The color of the background has no effect on the nature of the response in tadpoles.
4. The transition from the larval to the adult type of response takes place after metamorphosis.
5. Continued exposure to darkness produces a secondary reaction of expansion of the melanophores in the tadpole. This follows the primary reaction of contraction by an average of six hours.
6. To again obtain contraction of such expanded melanophores, the tadpole must be exposed to light.

The Movements of the Dog-fish as Determined by Olfactory Stimulation: G. H. PARKER.

A normal dog-fish, when confined in a large pool, swims more or less continuously back and forth, turning at the ends of its course. When excited by food, it courses over the bottom of the pool, turning now to the right, now to the left. This form of locomotion does not occur when the nostrils are occluded with cotton. Hence the food excitation is an olfactory response (Sheldon). When excited by food, a normal fish turns about as often to the left as to the right and generally exhibits a course like a figure eight. When only the left nostril is occluded, the fish turns predominately to the right; when the right nostril is plugged, predominately to the left. In each case the predominating turns may be as many as 90 per cent. of the total turns. These observations lead to the conclusion that, in seeking food, the dog-fish commonly turns toward the more vigorously stimulated nasal organ.

The Oxygen Utilization of Fishes: G. G. SCOTT.

Internal Pressure in Sponges: G. H. PARKER.

The internal pressure under which the current of water flows through a sponge was measured hydrostatically and found to vary in eight species of marine sponges from one to four millimeters of water. In *Spinosella sororia* an average finger discharges under a pressure of about three millimeters of water 78 liters of water a day. A colony of twenty such fingers would discharge about 1,575 liters a day, or over 415 gallons. Sponges move large volumes of water at very low pressure.

A Study of the So-called Life Cycle in Oxytricha fallax and Pleurotricha lanceolata: GEORGE A. BAITSELL.

Further Light on the Conjugation of Paramœcium: L. L. Woodruff.

This paper will appear in the *Jour. Exper. Zoology,* February, 1914.

Reactions of Amœba to Light: Asa A. Schaeffer.

Perpendicular beams of white and of monochromatic spectral light about 20 microns in diameter were projected through the microscope after being passed through 20 centimeters of water. The beams were projected in or near the paths of amœbas.

The amœbas reacted to these beams of light before they came into contact with them as seen by the human eye. In nearly all cases the reaction was positive, that is, the amœba moved toward the beam of light. There was very little, if any, difference observed in the reactions toward beams of white and of the various spectral monochromatic lights.

Brightly illuminated food particles were eaten neither more nor less readily than when illuminated evenly with the field; but when very slightly illuminated, that is, when laid on a "dark spot," the food object was sometimes not eaten.

Amœbas frequently move toward a beam of light in a curved path, finally coming into contact with it; occasionally the curved path extends around the beam of light so that the amœba encircles the beam for a greater or less distance without coming into contact with it. If an amœba has oriented itself with respect to a beam of light, the beam may then be extinguished without causing a change in the direction of movement. Such continuance of the direction of movement after an orienting stimulus is removed is due to "functional inertia," by virtue of which in this case the amœba tends to keep on moving in a certain direction after it is once started. No external stimuli are necessary for continuing in a straight path. The encircling of objects and of beams of light seems to be due to a balance between a tendency to keep on moving in the original direction (functional inertia) and a tendency to react positively to the stimulating object.

The Olfactory Sense of the Honey Bee: Norman Eugene McIndoo. (Introduced by E. F. Phillips.)

The Feeding Habits of Amblystoma Larvæ: H. S. Burr. (Introduced by R. G. Harrison.)

Normal *Amblystoma* larvæ use the visual sense in obtaining food when it is abundant. When the food becomes scarce the larvæ move slowly about in search of it, nosing in the débris at the bottom of the aquarium. This characteristic reaction suggests the use of the olfactory sense.

Experimental evidence was sought to determine how great was the reliance on this sense. Normal larvæ were tested with bits of motionless beef, sand and live but motionless Daphnids. These tests resulted positively—that is they snapped at the source of the stimulus—in 91.6 per cent. of the Daphnid tests and 38.7 per cent. of the sand tests. The reactions to the beef were comparable to those of the Daphnids.

From eight 5–6 mm. larvæ the nasal placodes were removed under a binocular microscope with the aid of a pair of iridectomy scissors. When they had begun to feed, they were tested by the same methods as were the normal larvæ. No reactions to beef or motionless Daphnids were obtained. To sand they reacted positively in 60.7 per cent. of the tests.

From eight 4–5 mm. larvæ the optic vesicles were removed. These were loaned to the writer by Dr. Henry Laurens. These were tested with motionless Daphnids. They reacted positively in 98.8 per cent. of the tests.

In the sand tests, the normal larvæ as they grew older showed an adaptation, in that the percentage of positive reactions was greatly reduced in the tests of the older individuals. The noseless individuals showed no such adaptation.

Hence we may conclude that the larval *Amblystoma,* while using the visual sense in obtaining food when it is abundant, may in the absence of moving food make use of the sense of smell, and that this sense is of increasing importance to the animal as it grows older.

Experimental Analysis of Certain Processes in the Food Vacuole of Bursaria: E. J. Lund. (Introduced by H. S. Jennings.)

ECOLOGY

The Life History of the Bullfrog (Rana Catesbeiana): Albert H. Wright. (Illustrated with lantern slides.)

Because of its size, appetite, vocal accomplishment and shyness, this species has received more attention than any other American member of the genus *Rana.* It frequents marshy bayous, buttonbush swamps, mill ponds, reservoirs, glacial or sphagnaceous lakes and some marshy streams. In first appearance this species is most influenced by water temperatures. When the air reaches 68–75 (certainly 76–79), we may expect the appearance of the bullfrog, provided the water bottoms are

57–64 or average 64–69. The average date of appearance is May 20, the earliest date May 11. At the mating season the first finger of the male becomes enlarged. The type of amplexation is axillary. The breeding season extends from June 15–August 1, the average date of beginning of ovulation being June 30. The female keeps in one position more or less and lays a pancakelike film of eggs on the surface of the water. This film may be from one foot to three feet in diameter. The eggs are laid among brush, driftwood, old stumps in water, etc. During ovulation the prevailing air temperatures are from 71–80; the water maxima from 66–71. It takes only a few minutes to lay the 12,000–20,000 eggs. The jelly is loose, the animal pole black, the vegetative pole white. There is no evident middle envelope. The eggs usually hatch in 5–3 days because usually subjected to a temperature of 65–80. The tadpoles require two or more years of growth before transformation. The relative smallness of the eggs (vitelli 1.2–1.7 mm. in diameter), the late deposition of the eggs, and the greater transformation size required (53 mm. instead of the 9.6 mm. of two or more winters in the larval stage. Besides the toad)—all combine to make this form spend other characters, the best external character is the tail with regular round black spots, some of which are dumb-bell-like in shape. The belly is straw- or maize-yellow, not iridescent. Transformation comes from July 18 to August 15 or months later.

An Experimental Study of the Behavior Agreement of the Animals of an Aquatic Community: V. E. SHELFORD.

The Relation Between Rheotaxis and Resistance to Potassium Cyanide in Isopoda: W. C. ALLEE.

The cyanide-resistance method which Professor Child worked out as a measure for the metabolic rate of planarians also holds for isopods. This is demonstrated by the effects of changes in temperature and mechanical stimulation upon the survival time in potassium cyanide; also by tests with young and old isopods, and by comparing the survival time and carbodioxide output in the same individuals. Average results from experiments on 452 isopods show that animals giving a highly positive rheotactic response have the highest rate of metabolism. Those giving a highly negative reaction are next, while isopods giving a low positive and high negative or indefinite response have a still lower metabolic rate. Isopods with a high efficiency of movement in the current have a higher rate of metabolism than those with low efficiency. These results support previous work on this subject.

MISCELLANEOUS SUBJECTS

The Reaction of the Honey Bee to Changes in External Temperature: E. F. PHILLIPS AND GEORGE S. DEMUTH.

The Organs of Special Sense of Prorhyncus: WILLIAM H. KEPNER AND WILLIAM H. TALIAFERRO.

The organs of special sense of this rhabdocele are the eyes and the ciliated pits. The two eyes lie beneath the epidermis, within the mesenchyme in depressions at the dorsal surface of the ganglia. The two ciliated pits open on the ventral side of the body anterior to the anterior limits of the surfaces of the ganglia and midway between the lateral surfaces of these cell masses and the margin of the body.

One of the unique features of these four organs is that they are formed of a definite number of cells. There are only eighteen cells involved in the formation of the four organs of special sense of *Prorhyncus*.

Each eye consists of two cells—an accessory or pigmented cell and a retinular or visual cell. The pigmented cell appears to be a modified mesenchymal cell. Its mesial cytoplasm resembles that of the typical mesenchymal cell. The lateral part of its cytoplasm, however, has assumed a definite, cup-like contour. This part of the cytoplasm, in its fixed condition, presents concentric lamellæ with which the pigment of the cell is associated. The mouth of this cup is directed laterally.

The retinular cell appears to be a modified nerve-element. Its nucleus has the characteristic spheroidal contour of a nerve-cell. In the cytoplasm, in its fixed condition, there are three regions. The lateral region is a finely granular cone that lies closely applied to the dorsal surface of the ganglion. The lateral end of this cone, we infer, is continued as a nerve-fiber into the ganglion. The basal or mesial fourth of this cytoplasmic region accommodates the nucleus. The middle cytoplasmic region of the retinular cell is the densest region. It is a concavo-convex disc. We are not prepared to say that this lens-shaped region of cytoplasm acts as a lens for converging the rays of light upon the pigment cell and rhabdome. We shall be content to look upon it as the supporting structure of the mesial cytoplasmic region, which is the rhabdome of the visual cell. The rhabdome is a low sugar loaf-shaped body that fills the cup of the pigmented cell.

The ciliated pits are invaginated regions of the

ventral epidermis, which are directed obliquely posteriorly and mesially. In the structure of each pit seven cells are involved. Six of these cells form a sensory syncytial lining or wall of the pit. These six cells are recognized by their nuclei, three of which form a dorso-ventral row in the lateral wall of the pit and three a similar row in the mesial wall. Stout cilia are borne by the general surface of the syncytial wall. This suffices for the prevalent conception of the structure of the ciliated pits of flatworms. But all of the surface of the wall of the pit does not bear cilia. Just over the middle nucleus of each side there is a well-differentiated sensory rod, so that we may look upon the wall of the pit as being formed by four accessory cells and two sensory cells. A special nerve from the ganglion runs to the posterior dorsal part of the sensory cells of each pit. The seventh cell of the pit is a large gland-cell, which crowns the widened base of the pit. The contour of this gland-cell is quite as indefinite as that of the unicellular glands of the general epidermis. Its secretion granules, however, can be differentiated from the secretion granules of the general epithelial glands by the use of Bordeau red. This unicellular gland opens by pores through the wall of the pit at the anterior angle of the fundus.

Therefore, as we have shown in *Microstoma caudatum*, the ciliated pit is not a simple highly ciliated structure, but it is differentiated into a ciliated, sensory region and a glandular region. Thus the inferred affinity between the *Platyhelminthes* and the *Nemertine* is strengthened by the close resemblance between the structure of the ciliated pit of the former to that of the simpler cerebral organs of the latter.

The Experimental Modifications of Tiger Beetle Color Patterns by Variation of Temperature and Moisture During Ontogeny: V. E. Shelford.

Some Experiments on Regeneration in Thinodrilus limosus: Mary T. Harman.

Both the anterior and posterior regeneration has been considered. At the anterior end of any piece the maximum number of segments regenerated is six plus the prostomium. The first external indication of differentiation is the differentiation of the prostomium followed closely by the first segment. After that the segment adjacent to the old part of the worm is differentiated from the newly regenerated portion and then the segments are differentiated from the base toward the tip in regular order. Although six segments plus the prostomium are the maximum number of segments regenerated, the size of the regenerated portion and the rate of regeneration varies with the level of the cut and is independent of the size of the regenerating piece and the amount of injury.

There is, also, a region of maximum rate of posterior regeneration and this is independent of the size of the regenerating piece and the degree of injury. The amount of posterior regeneration increases rather suddenly from the head to the region of maximum rate of regeneration and then decreases more gradually toward the tail region Pieces taken from the most posterior part of the worms do not live long and seldom show any regeneration. The direction of differentiation in the posterior regenerated part is from the base outward. However, the anal opening is soon formed. During regeneration a part of the most posterior portion of the regenerated tail remains unsegmented as a sort of segmental plate.

Will an Earthworm Regenerate Anterior Segments When the Enteric Epithelium is Absent From the Cut Surface?: H. W. Rand and H. R. Hunt.

The Fly, Œstrus Ovis, Parasitic in Man: H. F. Perkins.

More than a hundred living larvæ were discharged from a lung abscess in pus and mucus by a boy ill for several months. These small larvæ were identified as the early stage of the sheep bot *Œstrus ovis* and this determination has been corroborated by the Bureau of Entomology. Infection was by the mouth, the fly and the larvæ seeming to be attracted by the purulent discharges.

No case seems to have been recorded of an insect parasitic in the lung of man or any other mammal, and *Œ. ovis*, while it has been found in the frontal sinuses and rarely in the eyes and throat walls of man in Algeria, has only once or twice been found in man in America. The species is not uncommon in the region where this boy lives, and he took care of sheep for three years previous to his illness.

The larvæ were probably living in the abscess for at least three months, but none of them developed beyond the third stage, whereas normally they would in the same time have developed into flattened grubs of ten times the bulk, this retarded growth being attributable to the lack of oxygen in the non-functional lung.

The Effect of Alcohol on the Male Germ Cells, Studied by Means of Double Matings: L. J. Cole and C. L. Davis.

Recent work has amply demonstrated that offspring from alcoholized males are commonly defective to greater or less degree, even though the mother has not received treatment and is presumably normal. Stockard's experiments with guinea-pigs have been especially conclusive, and he has furthermore shown that the effects of the treatment may persist to the second generation of offspring.

The present experiments were undertaken to test this matter with rabbits, and to take advantage of the complete control possible in double matings, that is the mating of a single female to two males at the same period, and the consequent production of offspring from both fathers in a single litter. By breeding a male homozygous for color and an albino male both to an albino female it is possible to assign the young to their respective fathers, since the offspring of the colored male will be colored and those of the albino male will be albinos. If one of the males now be alcoholized while the other is normal, and offspring from both result, any differences, such as defects in the offspring, may safely be attributed to the effects of the alcoholizing of the male, since both sets of fetuses have developed in the same uterus at the same time, and consequently there can be no question of different environmental influences.

As a preliminary test 36 double matings were made in which both males were normal. Of these, 12, or 33⅓ per cent., were successful; that is, young were obtained from both fathers. An inspection of the 24 matings in which the two normal males were used, but in which all the resulting offspring were from one father, shows that the individuality of the male is of more importance than the order in which they are mated to the female. Thus one pigmented male (14.1), before he was alcoholized, was used in 23 matings, an albino male being used also in each case, with the following result:

In 15 litters all the young were from 14.1, although he gave first service in only 6 cases, and followed the albino male in 9 cases.

In 8 litters young were produced from both males. 14.1 gave first service in 3 cases, and was second in 5 cases. Of the 62 offspring produced, 14.1 was the father of 38, and the albino male of 24.

So while as a result of the whole 23 matings there were 190 offspring produced, the albino male sired only 24 of them.

These facts appear to establish a strong individual potency for 14.1. On the other hand, after he had been alcoholized (by the inhalation method), *he failed to sire any offspring at all* when used in conjunction with an albino male, although he was bred to the female first in at least 5 of the 7 matings made. But when he alone was bred to normal females, he sired several litters of young that appeared to be normal. There have since, however, appeared certain signs which may be indications of defects among these offspring.

Summary: There appear to be differences in the "potency" of the spermatozoa of different male rabbits. (This may be due to differential "vitality," expressed as greater or less motility, penetrating power or something of the sort.) Treating a male to the fumes of alcohol quickly lowers this "potency." Litters were born to alcoholized males (when used alone), but there are some indications of defects in the offspring.

Some Negative Results Obtained From Experiments With Fowl Tapeworms: JOHN W. SCOTT.

Ransom in 1909 mentions that we do not know the full life-history of any of the tape-worms found in American poultry. The following experiments were made in an attempt to find the intermediate host of two of three forms, *Hymenolepis carioca* and *Davainea tetragona*. A barnyard was located in which most of the fowls were infected with one or both of these parasites. A number of chicks as soon as hatched were placed in a large screened cage and kept there until the end of the experiment. (1) To one lot of these chicks two species (not determined) of *Menopon* were fed, the lice being collected in large numbers from no less than eighteen old and young fowls in the barnyard. The idea was that, since some of the lice are usually found feeding upon the skin and soiled feathers in the anal region, the fowl might easily swallow some of them while preening its feathers. (2) Within easy access, where the fowls spent much time in scratching out "wallows" around a dung heap, were small annelids (*Helodrilus parvus*). A large number of these were fed to a second lot of chicks. (3) House flies, hatched from pupæ in a screened cage, were exposed to ripe proglottids and to feces taken from the intestines of infected fowls; on following days they were fed to a third group of chicks. Not a single tapeworm was found in any of the chicks when killed, nor in the controls. These results are reported since they appear to be conclusively negative.

Hermaphroditism in the Brook Lamprey: PETER OKKELBERG. (Introduced by R. W. Hegner.)

In a study of the reproductive organs of the American brook lamprey, *Entosphenus wilderi,* it was found that a juvenile hermaphroditic condition occurs normally and that there were three kinds of individuals as regards sex, namely, true females, true males and hermaphrodites.

The sex glands of fifty larvæ, ranging from 7½ cm. to 20 cm. were studied and it was found that 46 per cent. were true females, 10 per cent. were true males and 44 per cent. hermaphrodites. In the adult condition males and females occur in practically equal numbers and the conclusion is reached that all the hermaphrodites develop into males. Out of 15 male specimens examined seven were found which contained undeveloped ova, —some a few and others a great number. These ova were similar in structure and size to those found in the larvæ.

The number of ova found in the mixed gland varied greatly. Sometimes only a single ovum was found and in other cases a large number of ova were present.

The hermaphroditic condition in the lamprey seems to be similar to that found in several of the other lower vertebrates such as *Myxine,* some Teleosts, and in some Amphibians.

EXHIBITS

During the meetings the following exhibits were made by members of the society in one of the rooms of the Zoological Laboratory of the University of Pennsylvania.

E. P. PHILLIPS AND GEORGE S. MUTH (Bureau of Entomology)—Instruments (Thermo-electric Outfit) (Special Scale), used in work on Behavior of the Honey Bee.

S. O. MAST (Johns Hopkins University)—Photographs and Autochromes showing changes in color and pattern in flounders.

ROBERT K. NABOURS (Kansas State Agricultural College)—Specimens and charts illustrating "Inheritance in Orthoptera."

M. F. GUYER (University of Wisconsin)—Demonstration of the X-element of Plymouth Rock Fowls.

J. E. ACKERT (Kansas Agricultural College)—Demonstration of the Innervation of the Integument of Chiroptera.

H. D. REED (Cornell University)—Model of the Pectoral and Axillary Glands in Schilbeodes gyrinus.

CASWELL GRAVE,
Secretary

THE ASSOCIATION OF AMERICAN GEOGRAPHERS

THE tenth annual meeting of the Association of American Geographers was held at Princeton, January 1 and 2, 1914. About thirty-five members were present and the attendance of members and non-members ranged from twenty-five to sixty. Thirty-six titles appeared on the final program and twenty-eight papers were read.

The officers for 1914 are as follows:

President—Albert Perry Brigham.

First Vice-president—Charles R. Dryer.

Second Vice-president—C. F. Marbut.

Secretary—Isaiah Bowman.

Treasurer—Francois E. Matthes.

Councilors—Lawrence Martin, Robert DeC. Ward, Alfred H. Brooks.

Editor—Richard E. Dodge.

The nominating committee for officers for 1915 consists of C. F. Marbut, chairman, R. H. Whitbeck, H. H. Barrows.

One of the most important features of the meeting was the adoption by the Association of the plan of cooperation proposed by the American Geographical Society. The plan provides for (1) a joint research committee of the two organizations to administer a joint research fund, (2) a joint meeting in New York each spring, (3) the publication by the Association in collaboration with the American Geographical Society of the Annals of the Association, (4) an interchange of the publications of the two societies.

The research committee of the Association consists of: Alfred H. Brooks, chairman, Herbert E. Gregory, Robert DeC. Ward.

An increasingly large proportion of the papers read dealt with various phases of human geography. The first meetings of the Association (1904–1906) were naturally marked by a large number of physiographic papers. Then came a period (1907–1910) when physiography and anthropogeography were alternately ahead. In the last three programs anthropogeography has led, owing chiefly to the growing number of students devoted to the life side of the science. Future programs will probably show a still stronger tendency in this direction, judging by the livelier discussions evoked by the more strictly geographic papers.

The joint meeting in New York will be held April 3–4. The next annual meeting will be held at some point west of Pittsburgh.

ISAIAH BOWMAN,
Secretary